Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) An image processing apparatus comprising a distortion correcting unit for sequentially performing distortion correction processing in units of block image data obtained by dividing an image data,

the image processing apparatus further comprising a distortion correction range calculating unit, separate from said distortion correcting unit, for calculating an input image range necessary for distortion correction processing performed on the block image data by the distortion correcting unit, wherein the distortion correction range calculating unit comprises:

a coordinate generating unit that generates interpolation coordinates corresponding to pixels in a coordinate system of the image data after distortion correction processing;

a distortion-correction coordinate transforming unit that applies a predetermined distortion correcting formula to the generated interpolation coordinate for transformation into coordinate positions of pixels in the coordinate system of the image data before distortion correction processing; and

a correcting range detecting unit for calculating the input image range necessary for the block image data in the image data before distortion correction processing from the transformed coordinate position,

wherein the distortion correction range calculating unit calculates the input image range for distortion correcting processing on a next block of image data

concurrently with execution of the distortion correcting processing of a block of image data preceding said next block of image data by the distortion correcting unit.

Claim 2. (Canceled)

3. (Presently presented) The image processing apparatus according to Claim 1, wherein the coordinate generating unit generates the interpolation coordinates by using only coordinate positions corresponding to pixels of a peripheral portion of a side of an output image range after distortion correction processing.

4. (Presently presented) The image processing apparatus according to Claim 3, wherein a shape of the output image range is rectangular, and the coordinate generating unit generates the interpolation coordinates by using only coordinate positions corresponding to pixels of four sides of the rectangular output image range.

5. (Presently presented) The image processing apparatus according to Claim 4, wherein the distortion correction range calculating unit calculates the input image range based on at least one of maximum and minimum values of the coordinate positions of the pixels corresponding to the four sides of the rectangular output image range and coordinate positions corresponding to pixels of four vertexes of the rectangular output image range, with respect to the coordinate positions generated by the coordinate transformation.

6. (Presently presented) The image processing apparatus according to

Claim 1, wherein the distortion-correction coordinate transforming unit performs the calculation included in the predetermined correcting formula on time-series data.

7. (Presently presented) The image processing apparatus according to Claim 1, wherein the coordinate generating unit obtains interpolation coordinates by performing predetermined thinning-out processing with respect to the interpolation coordinates for distortion correction processing.

8. (Presently presented) The image processing apparatus according to Claim 1, wherein the distortion correcting range calculating unit calculates the input image range by sequentially repeating the input image range calculation with respect to a plurality of input signals for distortion correction processing.

9. (Presently presented) The image processing apparatus according to Claim 1, wherein the input image range calculation is performed repeatedly, and a correcting magnification M is determined such that an image range after distortion correction processing comes within a predetermined range with respect to the input image range.

10. (Presently presented) The image processing apparatus according to Claim 8, wherein the input image range calculation is performed repeatedly, and a correcting magnification M is determined such that an image range after distortion correction processing comes within a predetermined range with respect to the input image range.

Claims 11-13. (Canceled)

14. (Withdrawn) An image processing apparatus comprising a distortion correcting unit for correcting distortion of image data, wherein the distortion correcting unit calculates the spatial position on the image pickup surface based on a describable coordinate system, upon calculating positions of pixels in the image before the distortion correction processing corresponding to pixels of a corrected image by using a predetermined correcting formula.

15. (Withdrawn) The image processing apparatus according to Claim 14, wherein the distortion correcting unit performs distortion correction processing of the image data in units of a first small-region included in the corrected image,

transforms the position on a corresponding coordinate system of the image pickup surface, of a second small-region on the image pickup surface including a small region obtained by transforming the coordinate positions of the pixels of the first small-region in accordance with the correcting formula, into a coordinate in the second small-region, and

thereafter generates data of the pixels of the corrected image.

16. (Withdrawn) The image processing apparatus according to Claim 14, wherein the image data is partial image data which is obtained by storing a part of the image pickup data.

17. (Withdrawn) The image processing apparatus according to Claim 16, wherein the partial image data is data obtained by cutting-out a part of the image pickup data.

18. (Withdrawn) The image processing apparatus according to Claim 16, wherein the partial image data is data which is obtained by thinning-out the image pickup data in at least one of the lateral direction and the longitudinal direction.

19. (Withdrawn) The image processing apparatus according to Claim 14, wherein the image data is generated by performing at least one of filtering, spatial sampling, and interpolation on the image pickup data.

20. (Withdrawn) The image processing apparatus according to Claim 14, wherein the image data has intervals on the spatial position of the pixels on the image pickup surface, and the intervals in the longitudinal direction are different from those in the lateral direction.

21. (Withdrawn) The image processing apparatus according to Claim 20, wherein, upon varying the spatial sampling interval between the pixels of the image data depending on in the lateral direction and in the longitudinal direction, a correcting formula for obtaining a coordinate in the image before the distortion correction processing includes a coefficient for correcting the difference between the sampling intervals in the longitudinal direction and those in the lateral direction.

22. (Withdrawn) The image processing apparatus according to Claim 14, wherein the correction of a predetermined offset can be performed by using the correcting formula for obtaining a coordinate in the image before the distortion correction processing.

23. (Withdrawn) The image processing apparatus according to Claim 15, wherein the correction of a predetermined offset can be performed by using the correcting formula for obtaining a coordinate in the image before the distortion correction processing.

24. (Withdrawn) The image processing apparatus according to Claim 22, wherein the offset correction is performed when the distortion center does not match the center of the image.

25. (Withdrawn) The image processing apparatus according to Claim 23, wherein the offset correction is performed when the distortion center does not match the center of the image.

26. (Withdrawn) A distortion correcting method of an image processing apparatus comprising a distortion correcting unit for correcting distortion of image data, the distortion correcting method comprising:

generating a first position on a coordinate system of pixels corresponding to each pixel of a corrected image;

transforming the first position into a second position on a coordinate system in the image data before the distortion correction processing in accordance with a distortion correcting formula;

transforming the second position on the coordinate system in the image data before the distortion correction processing into a coordinate in a setting region having a coordinate system corresponding to an image pickup surface, as the reference; and

generating data of the pixels of the corrected image by interpolation based on the coordinate in the setting region.

27. (Withdrawn) The distortion correcting method according to Claim 26, wherein the processing is performed in units of small region included in the corrected image.

28. (Withdrawn) An image processing apparatus comprising a distortion correcting unit for correcting distortion of image data,

wherein the distortion correcting unit comprises:

a memory unit that stores a part of the image data; and

a memory control unit that controls the writing and reading operation of data to/from the memory unit, and

an interpolation calculation is performed on the image data read from the memory unit.

29. (Withdrawn) The image processing apparatus according to Claim 28, wherein the memory control unit controls the writing operation in units of image data (unit line: UL) comprising a constant number of pixels aligned in one column in the column direction upon writing the data to the memory unit, and further controls the reading operation of the image data stored in the memory unit such that the image after the distortion correction processing is outputted in units of the UL, upon reading the data from the memory unit.

30. (Withdrawn) The image processing apparatus according to Claim 29, wherein the memory control unit has areas (preULB and postULB) with a

predetermined width on the front and back sides of the coordinate position of the pixel in the UL, first-processed, in the row direction, and controls the operation for preventing the overwriting operation of the region by another processing during the processing of the UL.

31. (Withdrawn) The image processing apparatus according to Claim 30, wherein the memory control unit further comprises:

a buffer-releasing amount calculating circuit that calculates a buffer capacity which can be released to input data from the previous stage of the distortion correcting unit during the processing of the UL; and

a data-sending possibility determining circuit that determines whether or not data is sendable to the later stage of the distortion correcting unit, wherein

the buffer-releasing amount calculating circuit receives the postULB of the interpolation coordinates, as center, for the first pixel in the processing of the UL, the data-sending possibility determining circuit receives the area preULB, the buffer-releasing amount calculating circuit calculates the releasing amount of buffer with reference to a value of the area postULB, and the data-sending possibility determining circuit determines, with reference to a value of the preULB, whether or not data is sendable.

32. (Withdrawn) The image processing apparatus according to Claim 30, wherein the value of the preULB and the value of the postULB can set values of the distortion centers, varied depending on a previous side and a subsequent side.

33. (Withdrawn) The image processing apparatus according to Claim 31, wherein the value of the preULB and the value of the postULB can set values of

the distortion centers, varied depending on a previous side and a subsequent side.

34. (Withdrawn) The image processing apparatus according to Claim 31, further comprising a buffer free capacity monitoring circuit that detects a buffer free-capacity,

wherein the buffer free-capacity monitoring circuit detects a free area in the buffer and then can write data to the free area.

35. (Withdrawn) The image processing apparatus according to Claim 28, wherein the memory unit comprises a plurality of memories that can simultaneously perform the reading operation and the writing operation of data,

the memory control unit further comprises:

a write-address generating circuit that controls the writing operation of data to the memory unit; and

a read-address generating circuit that generates an address for simultaneously reading data necessary for the interpolation calculation from the image data stored in the memory unit, wherein

the simultaneously-read data is written to different memories on the data writing operation.

36. (Withdrawn) The image processing apparatus according to Claim 30, further comprising an error detecting circuit that detects and outputs an error, upon distortion-corrected coordinates provided by of the preULB and postULB in the column direction being generated, with respect to the interpolation coordinate of the first image in the processing of the UL or upon the distortion-corrected coordinates being sent to coordinates that are not inputted from a previous stage.

37. (Withdrawn) The image processing apparatus according to Claim 31, further comprising an error detecting circuit that detects and outputs an error, upon generating the distortion-corrected coordinate out of the preULB and postULB in the column direction, relative to the interpolation coordinate of the first image in the processing of the UL or upon setting the distortion-corrected coordinate to a coordinate that is not inputted from the previous stage.

38. (Withdrawn) The image processing apparatus according to Claim 34, further comprising an error detecting circuit that detects and outputs an error, upon generating the distortion-corrected coordinate out of the preULB and postULB in the column direction, relative to the interpolation coordinate of the first image in the processing of the UL or upon setting the distortion-corrected coordinate to a coordinate that is not inputted from the previous stage.

39. (Withdrawn) The image processing apparatus according to Claim 36, wherein a register is set again upon the error being outputted, and the image processing can be executed again.

40. (Withdrawn) The image processing apparatus according to Claim 37, wherein a register is set again upon the error being outputted, and the image processing can be executed again.

41. (Withdrawn) The image processing apparatus according to Claim 38, wherein a register is set again upon the error being outputted, and the image processing can be executed again.

42. (Withdrawn) The image processing apparatus according to Claim 29, wherein the processing in units of 1 UL ends after processing 1 UL and calculating the first interpolation coordinates upon starting the processing of the next 1 UL or the next-to-next 1 UL.

43. (Withdrawn) The image processing apparatus according to Claim 30, wherein the processing in units of 1 UL ends after processing 1 UL and calculating the first interpolation coordinates upon starting the processing of the next 1 UL or the next-to-next 1 UL.

44. (Withdrawn) The image processing apparatus according to Claim 31, wherein the processing in units of 1 UL ends after processing 1 UL and calculating the first interpolation coordinates upon starting the processing of the next 1 UL or the next-to-next 1 UL.

45. (Withdrawn) The image processing apparatus according to Claim 34, wherein the processing in units of 1 UL ends after processing 1 UL and calculating the first interpolation coordinates upon starting the processing of the next 1 UL or the next-to-next 1 UL.

46. (Withdrawn) An image processing method for correcting distortion of image data, wherein, in the distortion correction, the image data is partly stored in a memory unit which is controlled for writing and reading operation of data, and the image data read from the memory unit is subjected to the interpolation calculation.

47. (Withdrawn) The image processing apparatus according to Claim 30, further comprising: a distortion correcting range calculating unit that calculates an input image range which is used for distortion correction by the distortion correcting unit.

48. (Withdrawn) The image processing apparatus according to Claim 31, further comprising: a distortion correcting range calculating unit that calculates an input image range which is used for distortion correction processing by the distortion correcting unit.

49. (Withdrawn) The image processing apparatus according to Claim 34, further comprising: a distortion correcting range calculating unit that calculates an input image range which is used for distortion correction by the distortion correcting unit.

50. (Withdrawn) The image processing apparatus according to Claim 47, wherein the distortion correcting range calculating unit can transform the coordinates by applying a predetermined distortion correcting formula, calculates at least, one of maximum and minimum values of the transformed coordinate generated by transforming the coordinates of corresponding pixels of four peripheral sides, and the transformed coordinates generated by transforming the coordinates of corresponding pixels of four vertexes, within an output image range after the distortion correction processing,

and calculates the preULB and the postULB based on an output result of the distortion correcting range calculating unit.

51. (Withdrawn) The image processing apparatus according to Claim 48, wherein the distortion correcting range calculating unit can transform the coordinates by applying a predetermined distortion correcting formula, calculates at least, one of maximum and minimum values of the transformed coordinate generated by transforming the coordinates of corresponding pixels of four peripheral sides, and the transformed coordinates generated by transforming the coordinates of corresponding pixels of four vertexes, within an output image range after the distortion correction processing,

and calculates the preULB and the postULB based on an output result of the distortion correcting range calculating unit.

52. (Withdrawn) The image processing apparatus according to Claim 49, wherein the distortion correcting range calculating unit can transform the coordinates by applying a predetermined distortion correcting formula, calculates at least, one of maximum and minimum values of the transformed coordinate generated by transforming the coordinates of corresponding pixels of four peripheral sides, and the transformed coordinates generated by transforming the coordinates of corresponding pixels of four vertexes, within an output image range after the distortion correction processing,

and calculates the preULB and the postULB based on an output result of the distortion correcting range calculating unit.